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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/895,687	06/29/2001	Kenneth R. Butcher	SE-30	6904

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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/895,687

Applicant(s)

BUTCHER ET AL.

Examiner

Mark Ruthkosky

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 12/9/2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 and 24-28 is/are rejected.
- 7) ☐ Claim(s) 21-23 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Drawings*

The drawings filed on 12/9/2002 have been approved.

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(c) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 18, 19, and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Carlstrom, Jr. et al. (US 6,015,633.)

The instant claims are to a system for humidifying a gas, such as a gas used in a fuel cell, comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing. The assembly includes a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber.

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing. The assembly includes a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.) Thus, the claims are anticipated.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 4, 11 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, and further in view of Roberts et al. (US 5,458,837.)

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing, with the assembly including a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into

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the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 4, 11 and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, ceramic material. Porous, ceramic wicking materials are well described in the art. For example, Roberts et al. (US 5,458,837) teaches a ceramic wick material for transferring liquids including a mixture of a ceramic material, a dispersion agent and a binding agent. Alumina, zirconium and silicon compounds are noted as ceramic materials (see col. 5, line 40- col. 6, line 30; col. 22, lines 60-end.) It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a ceramic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer liquids, such as water, in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633) teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will recognize from the teachings of Roberts et al. (US 5,458,837) that ceramic wicks will allow for the transfer of water from a water source through the wick. Claims 4 and 11 are product by process claims where the product is prepared by a process of mixing materials. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art,

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the claim is unpatentable even though the prior product was made by a different process.” The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 3, 5, 6, 7, 12, 13, 14, 20 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, and further in view of Vic (GB 2,162,680.)

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing, with the assembly including a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 5, 6, 12, 13, and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, metal material. Metallic wicks are well described in the art. Vic (GB 2,162,680) teaches wicking materials of porous iron and nickel. The wicks have a porosity of 50-95% (page 1, col. 2.) It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a porous, metallic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer liquids in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633)

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teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will recognize from the teachings of Vic (GB 2,162,680) that porous, metallic wicks will allow for the transfer of water through the wick. It would further be obvious to adjust the porosity of the wick in order to allow for specific amounts of liquid to be passed through the porous wick. As Vic teaches the porosity volume to be 50-90%, it would be obvious to one of ordinary skill in the art to adjust the porosity of a metallic wick to the degree taught in order to transfer the liquid. Claims 5, 6, 12 and 13 are product by process claims where the product is prepared by a process of mixing materials. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 3-17, 20, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, and further in view of Seidenberg (US 4,765,396.)

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing, the assembly including a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that

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the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 4, 11 and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, ceramic material. With regard to claims 3, 5, 6, 12, 13, and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, metal material. Seidenberg (US 4,765,396) teaches that ceramic and metallic porous wicks are well described in the prior art (col. 2.) Various metals and ceramics are noted. The prior art uses wicks to transfer heat, however one of ordinary skill in the art would recognize that these wicks may be used to transfer fluids in the fuel cell taught by Carlstrom, Jr. It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a porous, metallic or ceramic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer fluids in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633) teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will recognize from the teachings of Seidenberg (US 4,765,396) that porous, metallic and ceramic wicks will allow for the transfer of water through the wick.

With regard to claims 7-10, 14-17, and 24-27 the reference is silent to the composition of the wick, and therefore, does not teach the wick comprises a specific void volume, a specific void diameter or that the voids are in a substantially circular shape at the window of each void intersection. Seidenberg (US 4,765,396), however, teaches interconnecting, porous wicks with



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including a void volume of greater than 50% and a pore diameter of 10-12  $\mu\text{m}$  (col. 5, lines 27-end.) In addition, the reference teaches that one of ordinary skill in the art understands the significance of pore size and pore volume in a wick. When a pore size is small, capillary action increases, the permeability of the wick to radial and longitudinal fluid flow decreases, and the tendency to clog increases. Uniform porosity will allow for uniform flow and pressure. It would be obvious to one of ordinary skill in the art at the time the invention was made to adjust the void volume and the pore sizes of the wick taught in Carlstrom, Jr. et al. (US 6,015,633) in order to achieve a desired degree of humidity in the fuel cell. One of ordinary skill in the art would recognize from the teachings of Carlstrom, Jr. et al. (US 6,015,633) that the porous wicking material will act as a damper for supplying water to the fluid flow of reactant gasses which will be adjusted to regulate and distribute water in a fuel cell reactant gas stream. One of ordinary skill in the art would recognize from the teachings of Seidenberg (US 4,765,396) that the pore size and volume of the wick may be adjusted in order to adjust the flow of fluid through the wick. Thus, changes in pore size and volume would be obvious to one of ordinary skill in the art.

With regard to the limitation that the voids are in a substantially circular shape at the window of each void intersection, the prior art of record does not teach the shape of the pores. Using the limitation "substantially circular" is considered to encompass all pore shapes as they are noted to have a uniform pore size, which is indicative of a diameter, however, the shape of the pores is considered obvious (MPEP 2144.04(d)). The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 4, 5, 6, 11, 12 and 13 are product by process claims where the product is prepared by a process of mixing materials. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

***Allowable Subject Matter***

Claims 21-23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: The instant claims include a method of humidifying gasses by forming a ceramic wick made by mixing water, nitric acid, hollow polymer spheres and zirconium, alumina or silica ceramic materials. The instant claims further include a method of forming a metallic wick by adding a metallic material to a binding agent, water, and hollow polymer spheres. The prior art does not teach a method of humidifying gasses wherein a porous wick is formed from a mixture of water, nitric acid, hollow polymer spheres and a zirconium, alumina or silica ceramic material OR a mixture of a metallic material, a binding agent, water, and hollow polymer spheres. As the prior art does not teach such a method, the claims are allowable in scope over the prior art.

***Conclusion***

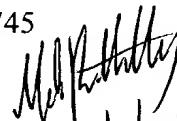
The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The cited art does not read upon the instant claims, however, the references include general teachings and relevant features as to the state of the art at the time of the invention.

***Examiner Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky  
Primary Patent Examiner  
Art Unit 1745

  
4/8/04